OCT. 7571

Clin. Otolaryngol. 1992, 17, 411–414

The effect of parental smoking on outcome after treatment for glue ear in children

A.RICHARD MAW,* A.J.PARKER,* G.N.LANCE† & M.G.DILKES*

**Department of Otolaryngology, Bristol Royal Infirmary and †Department of Computer Science, University of Bristol, UK*

Accepted for publication 1 April 1992

MAW A.R., PARKER A.J., LANCE G.N. & DILKES M.G.
(1992) *Clin. Otolaryngol.* 17, 411–414

The effect of parental smoking on outcome after treatment for glue ear in children

A sample of 201 children aged between 2 and 9 years with bilateral chronic otitis media with effusion (OME) were treated prospectively and at random by adenoidectomy, adenotonsillectomy, or with neither procedure. In all cases only a unilateral grommet was inserted and the contralateral unoperated ear was examined one year post-operatively for persistence or resolution of the effusion. A self-administered questionnaire was completed by the parents concerning their smoking habits. The resolution of effusion following surgery was assessed in relation to smoking by the mother and father separately and in combination. Clearance of glue was statistically less frequent where the child's mother or where both parents smoked. This was related to the number of cigarettes smoked by the mother or both parents. The adverse effect was demonstrable whether or not adenoidectomy or adenotonsillectomy had been performed for treatment. The findings lend further support to professional and governmental opinions of a deleterious effect of passive smoke exposure on children and in this case parental smoking has been shown to have an adverse effect on the outcome of OME following surgical treatment.

Keywords *otitis media with effusion passive smoking glue ear*

Although in general terms the smoking habit is slowly declining it is still said to remain the single most preventable cause of premature death and sickness. Thirty-one per cent of women and 35% of men were smokers in 1986 compared with 41% and 52% respectively in 1972.[1] Currently there is concern about the number of children who smoke and about the age at which the habit starts. Twenty-seven per cent of girls and 18% of boys are said to be regular smokers at the age of 15.[2] Smoking may affect an individual as part of an active process, but a significant number of children are affected by tobacco smoke in a passive manner, particularly in relation to maternal smoking. There is known to be a higher rate of minor ailments and absences from school in children whose mothers smoke.[3] A wide variety of studies have shown an adverse effect of parental smoking on the lower respiratory tract, with an increased incidence of pneumonia, bronchitis, asthma and coughs. Passive smoking also affects the upper respiratory tract and there is an increased incidence of sore throats which is especially related to maternal smoking.[4]

Studies in the past have shown conflicting results in relation to a causal link between passive smoking and the development of otitis media and middle ear effusions or glue ear. The relationship is complicated, firstly by the variable level of passive smoking to which the child is exposed, the age at which the studies are carried out and the other co-factors acting on the respiratory tract mucosa which are investigated coincidentally. Independently Kramer *et al.*,[5] Black,[6] Iverson *et al.*[7] and Hinton *et al.*[8] have shown an association between middle ear effusion and passive smoking exposure. They demonstrated a relationship with the degree of exposure and have also shown an increased risk with increasing age. However, no such relationship has been found by other investigators[9,10] and it has been suggested that this was because these studies were carried out in pre-school children. Nevertheless, Stewart *et al.*[11] failed to show a causal relationship in children aged between 5 and 9 years

Correspondence: A.Richard Maw, Department of Otolaryngology, Bristol Royal Infirmary, Bristol BS2 8HW, UK

2024228266

Source: https://www.industrydocuments.ucsf.edu/docs/ltvj0000

An investigation of Dutch kindergarten children by Van Cauwenberge[12] also showed no increased risk of middle ear effusions in children of parents who smoke, but there was a tendency for the children to develop negative middle ear pressures as shown by tympanometry. The study by Kramer *et al.*[3] showed a clear relationship between the increased risk of middle ear effusion for children both in households where there were two or more smokers and also where there was a household consumption of more than 30 cigarettes a day, the risk increasing three and four-fold respectively. There was an additive effect when nasal congestion and atopy were taken into account, which elevated the risk to sixfold. Most recently, Strachan *et al.*[13] have confirmed a relationship between passive smoking and an increased level of salivary cotinine, a derivative of nicotine, in children in whom there are also tympanometric changes confirming negative middle ear pressure. They showed a relationship between these tympanometric findings with maternal smoking, the numbers of smokers in the house and the type of accommodation. This is further evidence of a causal relationship between exposure to cigarette smoke passively in children and changes within the middle ear which are demonstrated objectively by tympanometry. It is likely that some older children in a household will be active smokers but the habit is expected to be infrequent in children less than 9 years of age. The present study examines prospectively the effects of maternal and paternal smoking habits on the outcome of treatment for glue ear in children aged between 2 and 9 years. The surgical aspects of this study have previously been reported[14,15] and we now present the effects of passive smoking in children with glue ear on outcome of treatment 1 year following adenoidectomy and adenotonsillectomy. A similar group in whom no pharyngeal surgery was performed is also included, reflecting the effect of smoke exposure on the untreated condition.

Subjects and method

The study population consisted of 201 children aged between 25 and 103 months with a mean age of 63 months. There were 131 boys and 70 girls. Surgery was performed on a randomly allocated basis in 3 groups of which 81 had adenoidectomy alone, 47 adenotonsillectomy and 73 did not have surgery performed, either to tonsils or adenoids. (After 150 cases had been analysed and reported,[14] adenotonsillectomy was discontinued for ethical reasons and adenomectomy was performed at random.) Middle ear effusions had been confirmed on 3 occasions during a 3-month period preoperatively and at operation only a unilateral myringotomy and grommet insertion was performed. The contralateral unoperated ear was examined by a validated otoscopist to confirm the presence of an effusion.[16] Subsequent follow-up was made at 1 year (±3 months) later and the same observer examined the unoperated ear by pneumatic otoscopy to assess clearance or persistence of the effusion. Pure-tone or free field audiometry and impedance studies were also carried out pre and post-operatively as previously described.[15] A self-administered questionnaire was completed preoperatively by one or both parents with respect to their smoking habits. The occupation of the father was noted and classified into 6 social classes as follows:

(1) Professional
(2) Intermediate
(3N) Skilled non-manual
(3M) Skilled manual
(5) Partly skilled
(6) Unskilled

Details were requested of the number of cigarettes (or tobacco equivalent for cigars and pipe tobacco) smoked per day during the previous 12 months by both the father and mother. They were also asked whether they had ever smoked during the previous 12 months. Parents were classified into non-smokers, mild smokers (1–9 cigarettes per day), moderate smokers (10–19 cigarettes per day) and heavy smokers (20 or more cigarettes per day).

STATISTICAL ANALYSIS

Bivariate statistics were used initially to investigate the distribution of the data which were shown in some cases not to be normally distributed. For this numerical data, a non-parametric Kruskal–Wallis analysis was used to compare the populations of those whose effusions had cleared against those in whom it remained in all the cases and in individual operation groups. For categorical data, such as those based upon no cigarettes, mild, moderate or heavy smoking as discussed earlier, a chi-squared analysis was used to make comparisons between the effusion resolved and effusion persisting populations, either as a whole or within each subgroup based on their treatment. The outcome variable of the presence or absence of glue in the unoperated ear at 1 year was assessed in relation to smoking by the mother and father, separately and in combination. The effects of smoking on outcome were therefore assessed for the whole group of 201 children and for the 3 treatment groups. An analysis of variance was also made to explore the relationship with the other variables, in particular the age and sex of the child, the type of operation performed and the socio-economic group of the father.

Results

The results of the statistical analysis are shown in Tables 1 and 2. There was significantly reduced otoscopic clearance of effusion in an unoperated ear at 1 year in those children whose parents smoked compared with those who did not

2024228267

Source: https://www.industrydocuments.ucsf.edu/docs/ltvj0000

Table 1. Variables analysed in relation to otoscopic clearance in an unoperated ear at 1 year in all cases and with respect to treatment group

(1) Numerical data
- (i) Age
- (ii) No. of cigarettes or equivalent smoked by father per day
- (iii) No. of cigarettes or equivalent smoked by mother per day
- (iv) No. of cigarettes or equivalent smoked by mother and father per day

(2) Categorical data
- (i) Socioeconomic group
- (ii) Whether father had ever smoked during the previous 12 months (0 to 1)
- (iii) Whether mother had ever smoked during the previous 12 months (0 or 1)

(3) Derived variants
- (i) No. of cigarettes or equivalent smoked by father per day expressed as
  - 0 = 0 (none)
  - 1 = 1–9 (mild)
  - 2 = 10–19 (moderate)
  - 3 = 20+ (heavy)
- (ii) No. of cigarettes or equivalent smoked by mother per day expressed as
  - 0 = 0 (none)
  - 1 = 1–9 (mild)
  - 2 = 10–19 (moderate)
  - 3 = 20+ (heavy)
- (iii) BS1: 0 = neither father or mother smoked
  - 1 = either father or mother smoked
  - 2 = both parents smoked
- (iv) BS2 sum of derived variants (i) and (ii)

This was evident in all cases where both parents or mother smoked, irrespective of whether surgery to the tonsils or adenoids was performed. Clearance was significantly enhanced in those who underwent adenoidectomy or adenotonsillectomy compared with those who did not receive pharyngeal surgery. The socioeconomic group of the father was, unexpectedly, found not to have a significant relationship to outcome by the analysis in terms of any of the smoking or other variables.

Discussion

This study shows for the first time an adverse effect on the outcome of surgical treatment for children with glue ear in relation to parental smoking habits. It further supports previous evidence in favour of a relationship between passive smoking and glue ear in children.[5–9] Bearing in mind the age of the children in this study it is unlikely that many were regular active smokers. These children had very well established bilateral disease. On average there was a previous history of subjective hearing loss for at least 18 months prior to inclusion in the study. The outcome variable, 'otoscopic clearance of effusion in an unoperated ear' was assessed by a validated observer[10] and we have reported previously the corresponding audiometric and tympanometric findings.[11] Despite the severity of the disease in these children we have shown that resolution of glue ear after treatment is reduced if the child's mother smokes and there is also a relationship between outcome and the number of cigarettes smoked by the mother. Furthermore, there is a more significant adverse effect on outcome if both parents smoke and again this

Table 2. Significant variables in relation to otoscopic clearance in an unoperated ear at 1 year

Parameters tested for significance between populations where fluid resolved and where it persisted	All cases ($n = 201$)	TA ($n = 47$)	A ($n = 81$)	No pharyngeal surgery ($n = 73$)
Numerical data: Kruskal–Wallis analysis				
(i) Age	$P < 0.05$	n.s.	n.s.	$P < 0.025$
(ii) Mother and father: no. of cigarettes or equivalent smoked per day	$P < 0.025$	n.s.	n.s.	n.s.
(2) Analysis of variance				
(i) Age	n.s.	n.s.	n.s.	$P < 0.025$
(ii) Mother: no. of cigarettes or equivalent smoked per day	$P < 0.05$	$P < 0.05$	n.s.	n.s.
(3) Categorical data: chi-squared analysis				
Derived variants				
BS1 (see Table 1)	n.s.	n.s.	$P < 0.05$	n.s.
BS2 (see Table 1)	$P < 0.05$	$P < 0.05$	n.s.	n.s.

TA, Adenotonsillectomy; A, adenoidectomy; n.s., not significant ($P > 0.05$).

2024228268

Source: https://www.industrydocuments.ucsf.edu/docs/ltvj0000

relates to the number of cigarettes smoked by both parents. This adverse effect on outcome is irrespective of whether or not surgical treatment is carried out. As demonstrated in previous studies the present analysis confirms a significant effect of the child's age on outcome following surgery for glue ear in that clearance is less common in the younger patients but the effects of parental smoking are independent of the age of the child. The study provides further support to professional and governmental advice that parental smoking is harmful to children. It suggests that the beneficial effect of surgery for glue ear by adenoidectomy will be reduced if the child returns to a household where there is exposure to tobacco smoke.

References

1 *General Household Survey*. (1986) HMSO
2 *On the State of the Public Health for the Year 1987*. HMSO
3 Charlton A. & Blair V. (1989) Absence from school related to children's and parental smoking habits. *Br. Med. J.* 298, 90–91
4 Willat D.J. (1986) Children's sore throats related to parental smoking. *Clin. Otolaryngol.* 11, 317–324
5 Kramer M.J., Richardson M.A., Weiss N.S. *et al.* (1983) Risk factors for persistent middle ear effusions: otitis media, catarrh, cigarette smoke exposure and atopy. *JAMA* 249, 1022–1025
6 Black N. (1985) The aetiology of glue ear: a case-control study. *Int. J. Pediat. Otorhinolaryngol.* 9, 121–133
7 Iversen M., Birch L., Lundqvist G.R. & Elbrond O. (1985) Middle ear effusion and the indoor environment. *Arch. Environ Health* 40, 74–79
8 Hinton A. (1989) Surgery for otitis media with effusion in children and its relationship to parental smoking. *J. Laryngol. Otol.* 103, 559–561
9 Vintner B., Elbrond O. & Brahl Pedersen C.A. (1979) Population study of otitis media in childhood. *Acta Otolaryngol. (Stockh.)* 360, (Suppl.) 121–123
10 Birch L. & Elbrond O. (1987) A prospective epidemiological study of secretory otitis media in young children related to the indoor environment. *J. Otorhinolaryngol. Relat. Spec.* 49, 253–258
11 Stewart I., Kirkland C., Simpson A., Silva P. & Williams S. (1984) Some factors of possible etiologic significance related to otitis media with effusion. In *Recent Advances in Otitis Media with Effusion*. Ed. D.J.Lim, pp. 25–27. BC Decker Inc. Philadelphia
12 Van Cauwenberge P.B. & Kluyskens P.M. (1984) Some predisposing factors in otitis media with effusion. In *Recent Advances in Otitis Media with Effusion*. Ed. D.J.Lim, pp. 28–32. BC Decker Inc. Philadelphia
13 Strachan D.P., Jarvis M.J. & Feyerabend C. (1989) Passive smoking and glue ear, salivary cotinine and impedance tympanometry in seven-year-old children. *Br. Med. J.* 298, 1549–1552
14 Maw A.R. (1983) Chronic otitis media with effusion (glue ear) and adenotonsillectomy: prospective randomised controlled study. *Br. Med. J.* 287, 1586–1588
15 Maw A.R. & Herod F. (1986) Otoscopic, impedance and audiometric findings in glue ear treated by adenoidectomy and tonsillectomy. A prospective randomised study. *Lancet* ii, 1399–1402
16 Maw A.R. (1979) Preliminary findings for inter-observer variability in children with middle ear effusions and adenoids. *Clin. Otolaryngol.* 4, 149

2024228269

Source: https://www.industrydocuments.ucsf.edu/docs/ltvj0000